

Climate Change and Mandatory Carbon Reporting: Impacts on Business Process and Performance

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ABSTRACT

As part of their annual directors' report, UK-listed companies are now required to disclose their greenhouse gas emissions and account publicly for their contributions to climate change. This paper uses this mandatory carbon reporting to explore wider debates about corporate social responsibility and the purpose, practice, and impacts of such non-financial reporting. Empirically, it combines documentary analysis of the carbon reporting practices of 176 large firms listed in the FTSE100 and/or subject to the UK government's adaptation reporting power with 60 interviews with stakeholders involved in carbon reporting. Firms disclose their emissions in response to financial incentives, social pressure and/or regulatory compulsion. In turn, rationales shape whether and how carbon reporting influences internal business processes and performance. The importance of reporting to the bottom line varies by sector depending on two variables – energy intensity and economic regulator status – yet there is limited evidence that carbon reporting is driving substantial reductions in emissions. Findings suggest reasons for caution about hopes for 'nudging' firms to improve their environmental performance and social responsibility through disclosure requirements. © 2017 The Authors. Business Strategy and the Environment published by ERP Environment and John Wiley & Sons Ltd

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Introduction

LIKE OTHER FORMS OF NON-FINANCIAL BUSINESS REPORTING, CORPORATE CARBON REPORTING – THE DISCLOSURE OF GREENHOUSE GAS (GHG) emission accounts – has become increasingly common over the last decade (Knox-Hayes and Levy, 2011; Sullivan and Gouldson, 2012; Varnäs *et al.*, 2013). For instance, the number of firms reporting their emissions to the Carbon Disclosure Project's (CDP) voluntary climate reporting index grew fivefold, from 221 respondents in 2003 to 1971 in 2014 (CDP, 2014). The CDP is far from the only reporting framework through which businesses are now publicly accounting for their GHG emissions. Scholars and business analysts have offered a number of competing explanations for this expansion of corporate social responsibility (CSR) reporting about carbon, ranging from rational pursuit of cost savings (Kolk and Pinkse, 2004; Hoffman, 2007), brand

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differentiation (Delmas *et al.*, 2006; Matisoff *et al.*, 2013) or reputational gains (Hoffman, 2005) to coercive pressures from regulators (Levy and Egan, 2003; Lyon and Maxwell, 2004; Jones and Levy, 2007), institutional investors (Pfeifer and Sullivan, 2008; Knox-Hayes and Levy, 2011; Sullivan and Gouldson, 2012; Cotter and Najah, 2012) or environmental pressure groups (Stanny and Ely, 2008; Hahn *et al.*, 2015) and mimetic pressures to follow the latest corporate fashions in CSR (Sullivan, 2008; Ihlen, 2009).

Beyond this debate about the appeals of corporate carbon reporting and the reasons for its increasing volume and frequency, there are also questions about whether and how the practice of publicly accounting for GHG emissions influences organizational behaviour and the economic and environmental bottom line. Some scholars argue that CSR practices such as carbon reporting not only minimize pollution and environmental harm, but also promote profitability, technological innovation, and wider economic competitiveness (Hajer, 1995; Mol *et al.*, 2009). Such ecological modernization promises to reconcile the imperatives of economic growth and profit with environmental protection, delivering win-win outcomes (Boiral *et al.*, 2012; Gouldson and Sullivan, 2012).

In the hope that disclosure will incentivize business innovation and improved environmental performance, the UK government recently became the first jurisdiction in the world to require publicly listed firms to account for their greenhouse gas emissions as part of their annual financial reporting. Other jurisdictions, such as Norway, Singapore, and Hong Kong, are now following the British lead in requiring companies to report on their GHG emissions. However, as Jones and Levy (2007, p. 429) note, 'the relentless upward trend in emissions presents something of a paradox'. Although the proportion of firms engaged in carbon reporting has increased substantially over the last decade, the rate of emission reductions made by UK firms has actually slowed. 'Between 1990 and 2008, business sectors reduced GHG emissions by 19% but just 4% of this reduction took place in the period 1999–2008' (Haslam *et al.*, 2014, p. 204), even though firms devoted greater efforts to monitoring and reporting on their progress in reducing emissions.

Critical studies of CSR reporting have highlighted its purely performative qualities and raised doubts about its efficacy in altering organizational behaviour or improving sustainability and the bottom line (Bansal and Roth, 2000). Other scholars dismiss carbon reporting – like CSR more generally (Greer and Bruno, 1996) – as calculated 'greenwashing' (Okereke, 2007; Lyon and Maxwell, 2011; Bowen, 2014): an entirely outward-facing activity designed to 'gain or extend legitimacy, to maintain its level of current legitimacy, or to repair or to defend its lost or threatened legitimacy' (O'Donovan, 2002, p. 349). In seeking to influence the perceptions of external stakeholders, companies are often selective about what they report, carefully manicuring their image by emphasizing short-term positive environmental performance to draw attention away from worsening overall standards (Vos, 2009) or using environmental performance to re-brand and downplay less ethical organizational practices and outcomes (Jahdi and Acikdilli, 2009).

Rather than calculated dissembling, others explain the tendency for CSR reporting to be de-coupled from organizational performance in terms of mimetic pressures for businesses to report simply for the sake of it rather than for any other substantive goal that would be furthered by collecting and reporting GHG emission data (Shore and Wright, 1999; Power, 2003; Shore, 2008). From this perspective, firms report because they are expected to, and so their reporting activity has little influence on organizational performance beyond demonstrating compliance with regulatory reporting requirements, wider social norms and competitor behaviour. Observable organizational behaviour consistent with this perspective would include ritualistic disclosure, adoption of a 'tick-box attitude', and employment of dedicated environmental specialists trained in environmental science to give disclosure scientific credibility (Stubbs *et al.*, 2013).

This paper uses the case of carbon reporting to address these wider questions about the purpose, practice, and impacts of non-financial reporting and thereby contribute to wider debates about CSR and disclosure requirements. To date most of the research on carbon reporting has focused on the rationales for and impacts of voluntary disclosures (Taurangana and Chithambo, 2015; Giannarakis *et al.*, 2017), whereas our analysis also considers responses to mandatory reporting, so as to speak to wider policy questions about the effectiveness of transparency requirements in nudging firms to behave more sustainably (Escobar and Demeritt, 2017). After a brief description of our sample frame and methodology, we present our findings in four main sections. First we describe the different carbon reporting schemes and how firms from different sectors in our sample have responded to their requirements. Then we discuss the various rationales for carbon reporting and identify several widely observable drivers for carbon disclosures. Third, we describe how carbon reporting has influenced internal business processes and organization, before assessing its impacts on emission reduction. A discussion section draws together findings to explain sectoral variations in the rationales for and impacts of carbon reporting across the sample. The paper concludes by summarizing its wider contributions to knowledge.

Methodology

Drawing on the traditions of interpretative social science (Demeritt and Dyer, 2002), we combine extensive methods of systematic documentary analysis with intensive methods of in-depth interviews to explore the rationales for and impacts of carbon reporting by large corporations based in the UK. UK firms provide an ideal sample to explore business responses to carbon reporting, because they were historically among the earliest and most proactive firms at disclosing emission data voluntarily (CDP, 2013) and now face multiple obligations to report on their emissions (Kauffmann *et al.*, 2012), including a new mandatory carbon reporting (MCR) requirement that came into force in October 2013. Furthermore, the diversity of the UK corporate sector offers comparative opportunities to explore the relative influence of different drivers on reporting practice and business performance (Nyberg and Wright, 2012).

The first extensive phase of research involved a systematic desktop review of annual company reports from the 112 firms listed among the FTSE 100 in the period 1 June 2013 to 30 September 2014 and thus subject to the MCR, as well as 20 transportation infrastructure providers (classified as industrials) and 32 utilities, which, as critical infrastructure providers, were subject to adaptation reporting requirements under the Adaptation Reporting Power exercised by the UK Department for Environment, Food, and Rural Affairs (Defra) under the Climate Change Act 2008. As well as gathering an extensive corpus of discourse data about corporate responses to climate change, the desktop review also gathered quantitative data about emissions from those firms making it publicly available in their annual reports. Each firm was then ranked in terms of four ordinal levels of climate disclosure: from level 0 for those firms not disclosing any information about their climate strategies and emissions, to level 3 for those providing detailed text and quantitative data (see Tang, 2016, for details of classification methods).

Then, from this set of 168 firms, a second more intensive phase of interview research involved interviews with an opportunistic sample of 19 firms from four case study industrial sectors: extractives, financial services, energy utilities and water utilities. These sectors were chosen because of their differing levels and forms of engagement with climate change. Whereas the very visible impacts on climate change from oil, gas and mining operations have meant that the extractives industry has long been proactive at both the sectoral and firm levels (Levy and Kolk, 2002; Ford *et al.*, 2010; Pellegrino and Lodhia, 2012), the financial services industry has been slower to respond to climate change (Kolk and Pinkse, 2004; Furrer *et al.*, 2012). Among utilities, the literature suggests that engagement with climate change is consistently higher, but whereas energy generation and distribution utilities have tended to emphasize mitigation (Weinhofer and Hoffmann, 2010; Sprengel and Busch, 2010) water utilities have tended to be more concerned with adaptation (Tang and Dessai, 2012; Gasbarro *et al.*, 2014). Our purposeful sample of industrial sectors will enable us to explore the influence of these sectoral factors on firm-level understandings of and responses to carbon reporting.

Contact was attempted with representatives of all the firms in our four target sectors, with all of those willing to participate interviewed. In total, we completed 36 semi-structured interviews with individuals including executives and specialists in climate change, sustainability, energy policy, supply chain, procurement, finance, health and safety, and marketing, from 19 firms (Table 1), whose levels of climate information disclosure ranged from limited

Industrial sector		Company					Total for sector
		A	B	C	D	E	
Extractives	No. of interviews	2	2	1	4	1	10
	Disclosure level	3	3	3	3	3	
Financial services	No. of interviews	2	1	1	1	1	6
	Disclosure level	2	1	2	2	3	
Energy utilities	No. of interviews	4	3	2	1		10
	Disclosure level	3	3	3	0		
Water utilities	No. of interviews	2	2	2	3	1	10
	Disclosure level	3	3	3	3	3	

Table 1. Number of interview participants and level of climate information disclosure by firm and industrial sector
See Tang (2016) for details of disclosure level.

data and text (Level 1) to detailed data and text (Level 3) (see Tang, 2016). Where possible, interviews were conducted with multiple individuals within participating firms to enhance validity through source triangulation (Yin, 2003). To encourage honest and accurate responses and protect respondent confidentiality, participating interviewees and their organizations are only described in broadly non-identifying terms. Industry respondents were asked to reflect on their role within the firm, the firm's approach to environmental issues, the historical context of the firm's engagement with climate change, the firm's current climate change responses, and its status as leader or laggard relative to key competitors. In parallel with these case study interviews, we conducted a further set of 24 semi-structured interviews with individuals representing either government ($n = 10$), regulators ($n = 4$), consultants ($n = 4$), or non-profit organizations ($n = 6$) involved in the design and practice of carbon reporting schemes. Each interview lasted between 40 and 80 minutes and was recorded and fully transcribed, providing a rich and extensive source of qualitative data, which was analytically triangulated against the findings from the initial desktop review.

With both the textual material from company reports and interview transcripts, the first stage of data analysis involved careful reading followed by an iterative process of 'open coding' (Corbin and Strauss, 1990). Using NVivo, we created nodes – combining segments of text reflecting similar wordings or activities – representing different rationales (e.g. measures emissions), practices (e.g. collect Scope 1 and 2 emissions), and impacts of reporting (e.g. enhanced energy efficiency). Emergent themes within these nodes and across the four case study sectors were then coded. In the final stage of data analysis axial coding was used to search for patterns and relationships within and between nodes and case study sectors (Strauss and Corbin, 1998), including the relationship between companies' level of disclosure, their climate strategy, and their status as sectoral leaders or laggards, which has been identified as an important factor by some past research (Lee, 2012; Sprengel and Busch, 2010).

Carbon Reporting Schemes and Requirements

The last 20 years have seen the emergence of a wide variety of schemes for encouraging – and sometimes legally requiring – companies to measure and report their GHG emissions. In 2009, Green (2010) counted some 25 voluntary GHG reporting schemes worldwide, collecting and disseminating a variety of information about direct emissions by firms of carbon dioxide and other GHGs (so-called Scope 1 emissions), as well as Scope 2 emissions arising indirectly as a consequence of the energy that firms purchase and consume. Some voluntary schemes also collect data on Scope 3 emissions, which include all other emissions indirectly attributable to firms as a result of the production of purchased inputs, transportation on common carriers, out-sourced activities, and the processing and ultimate disposal of firm products and waste. While international standards have emerged for accounting for these different kinds of GHG emission (Kolk *et al.*, 2008; Milne and Grubnic, 2011), voluntary reporting frameworks often collect different kinds of information, which they aggregate and disclose in different ways that can complicate comparison. The most prominent voluntary scheme for reporting GHG emissions is probably the CDP, which was founded in 2003 to collect information from participating firms on their climate-change-related risks and opportunities, GHG emissions and climate change management systems and processes on behalf of its 800+ institutional investor signatories (Matisoff *et al.*, 2013).

In addition to these voluntary schemes for disclosing GHG emissions, firms in many jurisdictions also face various mandatory requirements to report on their GHG emissions. In the UK, energy intensive firms participating in the emission trading schemes (e.g. EU ETS) – run first by the UK government and then the EU – have been required to report on their direct Scope 1 emissions since 2002, in addition to reporting on their energy consumption as part of the Climate Change Levy, which was introduced in 2001. Similar reporting requirements were extended in 2010 to large, but less energy intensive companies and public sector organizations through the UK government's Carbon Reduction Commitment (CRC), which requires organizations to report the gas and electricity consumed by their UK operations. In 2013 the UK government significantly expanded the extent and reach of emission reporting by introducing a mandatory carbon reporting requirement (MCR) on all UK incorporated and publicly listed companies on the Main Market of the London Stock Exchange.¹ Applying to some 1100 listed companies, the MCR

¹The MCR also applies to companies operating in the UK and listed in an EEA state, or admitted to trading on the New York Stock Exchange or NASDAQ Stock Market (Crown, 2006).

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Industrial sector	Firms in sample	Reporting prior to MCR	Subject to MCR	Fully compliant with MCR	Exceeding MCR requirements
Oil & gas	5	4 (80%)	5 (100%)	5 (100%)	1 (20%)
Basic materials	15	13 (87%)	1 (7%)	14 (93%)	5 (33%)
Industrials	39	21 (54%)	19 (49%)	25 (64%)	4 (8%)
Consumer goods	12	10 (83%)	12 (100%)	11 (92%)	5 (42%)
Healthcare	6	3 (50%)	6 (100%)	5 (83%)	3 (50%)
Consumer service	22	18 (82%)	22 (100%)	21 (95%)	6 (27%)
Telecommunications	5	4 (80%)	5 (100%)	5 (100%)	2 (40%)
Utilities	37	21 (57%)	5 (14%)	18 (49%)	7 (8%)
Financials	23	21 (91%)	23 (100%)	21 (91%)	10 (43%)
Technology	4	4 (100%)	4 (100%)	4 (100%)	0 (0%)
TOTAL	168	119 (71%)	116 (69%)	129 (77%)	43 (26%)

Table 2. Greenhouse gas reporting by firm study sample

requires companies to account for their Scope 1 and Scope 2 GHG emissions as part of their annual (directors') report (Defra, 2014). In turn, Defra guidance on reporting methodology has encouraged other organizations not directly subject to the mandate to report voluntarily (Tauringana and Chithambo, 2015).

Of the 168 firms in our sample, 116 (69%) were subject to the MCR (Table 2), with all but six (5%) fully compliant with its reporting requirements. In addition, a number of critical infrastructure providers not formally subject to the MCR also complied with its reporting requirements voluntarily. Voluntary compliance was much higher among utilities, with 19 of 32 (59%) not subject to the MCR still reporting Scope 1 and 2 emissions in their annual reports, than among transportation infrastructure providers, where only a quarter (5 of 20) critical infrastructure providers in the industrial sector exempt from the MCR complied with its reporting requirements voluntarily. Even before the MCR came into force in 2013, more than two-thirds (71%) of firms in our sample were including the required emission data in their 2012 annual reports (Table 2), with the rate of voluntary compliance highest in the technology (100%), financials (91%) and basic materials (87%) sectors (Table 2). However, firms in these sectors were somewhat less likely to exceed its requirements by reporting on Scope 3 emissions than firms in the healthcare (50%), financials (43%) and consumer goods (42%) sectors (Table 2), where a larger proportion of firms chose to disclose additional information about their emissions and climate strategies.

In the next section we draw on qualitative data from company reports and case study interviews to explore the rationales for reporting and the reasons why particular firms and sectors may lead or lag competitors in their level of climate disclosure.

Rationales for Carbon Reporting

We identified three broad rationales for carbon reporting. A first rationale was financial, which previous studies have identified as a strong motive for environmental reporting (Kolk and Pinkse, 2004; Hoffman, 2005; Knox-Hayes and Levy, 2011). Emissions are inextricably linked to energy consumption, which can be a major contributor to net corporate expenditure. As one energy intensive extractive industry representative explained,

Most of our emissions are associated with fuel combustion. From our perspective there is a strong alignment between cost drivers and environmental goals, where every bit of fuel we burn costs us money. Our facilities energy bill is massive because we use a lot of electricity and natural gas. If we can reduce our energy usage we can reduce our costs and emissions. Reporting helps to keep us updated (Extractive D, Interview 4).

This informant's firm measures emissions to identify process optimizations to reduce emissions and thus costs. Insofar as emission reduction 'is a good proxy' for the overall efficiency of the firm, this informant suggested that carbon reporting was a good way for managers to measure and make transparent their impact on overall company performance, since reducing environmental impact directly improves the firm's bottom line (Gouldson *et al.*, 2008; Boiral *et al.*, 2012). This comment provides support for the claims of those scholars who have argued that the level of voluntary climate disclosure will depend on the firm's environmental performance (Dawkins and Fraas, 2011), with only those showing big reductions likely to volunteer much information beyond the direct emissions now required by law under the MCR.

While economic rationales were common, they were not closely tied to the level of disclosure. Some two-thirds of the 168 firms in our sample claim in their annual report that there are financial benefits to reducing their emissions and being more energy efficient, but only 73 (43%) were providing the very highest level of detailed data and text about the breakdown of their emissions by source and scope or their strategies for reducing them. Even when detailed reporting was provided, the savings claimed sometimes amounted to rather less than they might seem at first glance. For example,

Our sustainability initiatives in 2013 have delivered estimated savings of £400,000 in energy costs. The most effective changes have been achieved through the roll out of energy efficient lighting. This has generated savings of 1,045 tonnes of CO₂e. Lighting remains the biggest source of carbon emissions (Hammerson, 2014, p. 27).

Such figures sound impressive until they are compared against a gross rental income for this shopping mall development company of £321.2 million. Most of its costs are sunk capital for real estate. Its Scope 1 and 2 emissions from ongoing energy consumption comprise a relatively small part of its cost base, and so the economic incentives to reduce these emissions – and to report on the reductions – are as not significant as they may appear at first glance, while there are no economic incentives to reduce Scope 3 emissions generated farther up the supply chain.

For many service sector firms there is limited scope for making energy-related savings. One financial service employee explained how his firm had little control over its direct emissions:

When you are in a business that is producing relatively modest amounts of emissions anyway there is a limitation in what you can do. The building we occupy, we have no influence whatsoever on the amount of electricity that is being consumed as a whole. An outside contractor manages the building. A charge is levied to every occupant. We have lighting that switches off when there is no movement detected, but I am not sure what else we can do that has any meaning (Financial Service B, Interview 1).

Since this firm rents space in an office building, it has no control over the major sources of energy usage for heating and cooling and little incentive to invest in more energy efficient computers or other office equipment, because its energy charges are not levied on the basis of usage. Even if they were, these energy-related operating costs would be tiny in comparison to remuneration, capital charges, and other expenditure.

Since they had the greatest potential for savings, it is not unsurprising that energy intensive firms were the most consistent and enthusiastic in articulating economic rationales for monitoring emissions and reporting. In both its ecologically modernizing rationale and its rather broad brush lack of detail, the following comment was typical of the tone adopted by energy intensive firms in their corporate annual reports:

Energy accounts for over 10% of the mining division's operating costs, so improving efficiency can have significant financial, as well as environmental benefits (Antofagasta, 2014).

Whilst energy intensive firms often claim to be making significant emission reductions, it is difficult for them to make absolute reductions, since output and growth are tied so closely to energy consumption (Sullivan, 2008). Accordingly, claims about reductions were often framed in relative terms, such as emissions per unit output.

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In addition to the potential for direct economic savings through energy efficiency, energy intensive firms often expressed an interest in carbon reporting because of its close relationship to their liabilities for carbon taxes and other levies on energy usage, such as the Carbon Reduction Commitment (CRC) and EU Emissions Trading Scheme (EU ETS).

We do the CRC, which is mandatory because of our size and energy usage, and also the EU ETS. Reporting correctly ensures we are taxed appropriately (Energy Utility A, Interview 2).

Whilst reporting is required, firms noted that it also helped them ensure they are not over-taxed. Other less energy intensive firms did not face these pressures and consequently were less consistent in their embrace of economic rationales for measuring and reporting their emissions. These sectoral differences in the appeal of economic rationales held regardless of the level of disclosure or whether and when the firm had signed up to any voluntary reporting schemes such as the Carbon Disclosure Project or FTSE4good.

A second rationale for carbon reporting was reputational. Even if the direct savings were relatively small, many firms were still interested in reporting as a way to curry favour with key stakeholders by demonstrating their commitment to climate change (Pfeifer and Sullivan, 2008; Sullivan and Gouldson, 2012; Matisoff *et al.*, 2013). Just over a third (36%) of interviewees explicitly mentioned external pressure from investors, shareholders or clients as a rationale driving their firm to report voluntarily or go beyond the minimum reporting requirements of the MCR. A representative from one firm that had taken an early lead in reporting its Scope 3 emissions explained.

Nowadays more and more shareholders, investors and clients are interested in our reporting of carbon emissions and similar climate change issues. They want to know what we are doing and how we are reducing them (Energy Utility A, Interview 1).

Carbon reporting provided an opportunity for this firm to show investors that it was doing its bit by making year-on-year reductions in its contributions to climate change. In addition to their concerns about the firms' environmental impacts, stakeholders also use emission data as a proxy for good management (Knox-Hayes and Levy, 2011). This rationale was highlighted by one consultant involved in helping companies to organize their carbon reporting:

Stakeholders understand that the more carbon there is in the atmosphere the worst it will be. So it is very easy to compare emissions data and progress against one another (Consultant D).

We identified several distinct ways in which firms perceive carbon reporting as part of a more general process of impression management. Some firms participate in various voluntary carbon reporting schemes to 'distinguish themselves from competitors and gain recognition' (Matisoff *et al.*, 2013, p. 297). For instance, one interviewee highlighted the potential importance of their voluntary participation in CDP's Climate Change Program for investor decision-making:

It is important that we put out to the investor community the work we are doing. It might form part of their tick box criteria if we have CDP. They might put a tick against our name and so on (Water E, Interview 1).

CDP publishes emission performance tables that rank firms both generally and by sector. These league tables are made available to potential investors to inform their decisions about where to invest (Knox-Hayes and Levy, 2011). This creates a competitive environment where firms aim to outperform their peers to gain kudos and ultimately attract new investment, as this informant explained:

CDP is an opportunity to show our investors what and how we are tackling climate change. CDP is a good platform because it allows for benchmarking. We are doing very well in our sector. We are leaders (Financial Service E, Interview 1).

Topping the league tables is a powerful way for firms – and their senior staff – to differentiate themselves in a crowded field.

Other firms carry out carbon reporting for defensive reasons of reputation management. Firms are sensitive about potential damage to their 'brand' (Eccles and DiPiazza, 2002) and hope that reporting will not only demonstrate their effectiveness in tackling climate change, but also build more general confidence that management 'knows what they are doing' (Kolk and Pinkse, 2004; Hoffman, 2005). One informant explained how reporting can provide a way to contextualize facts and figures that might otherwise look bad if left unexplained:

Carbon reporting allows you to explain why emissions have gone up. If you take the 2012 winter, it was very wet. We had an awful lot of infiltration of surface water into our sewers. We had to pump an awful lot of additional water that correlated with an increase in energy consumption and emissions. We used the data to explain this was what was going on inside the business before people started asking about why our total emissions had gone up and why their water bills had increased (Water C, Interview 2).

While this kind of defensively motivated reporting resembles greenwashing behaviour, others explain that their reporting is simply about matching peer activity rather than for any substantive purpose:

If our peers are doing it then it's likely that we will do it. You're always horizon scanning about what other firms are doing (Financial Service C, Interview 1).

This purely mimetic rationale was offered by interviewees from seven firms (both energy and non-energy-intensive), who all explained that the decision to report was driven by the desire to keep up with competitors. Similar to the study by Stanny and Ely (2008) of US firms, fears of being perceived as a bad corporate citizen or having something to hide were strong incentives for our case study firms to continue reporting even when they perceived no practical value in doing so. This herding instinct was defensive in its motives and reflected concerns about the reputational risks of going it alone.

The other big six energy firms in the UK take part [in CDP's Climate Change Program], so again it would seem strange or wrong to not take part. It would have looked strange if we were the only ones not involved (Energy Utility C, Interview 2).

Participation at least ensures they are matching the basic activities of peers, and thereby avoiding the potential risk of departing from the norm. Likewise, in his study of how climate change is treated rhetorically in the non-financial reports of the world's 30 largest corporations, Ihlen (2009) found that, regardless of their environmental record, firms echo the same rhetoric and ideals as their competitors. While this kind of mimetically motivated reporting may increase corporate engagement with climate change, it does not guarantee that a firm takes the same actions as their peers. Indeed, Ihlen (2009) suggests that it may instead mask negative performance, because stakeholders assume firms are acting in the same way due to similarities in reporting.

A third major driver of carbon reporting is regulatory. Long before the MCR came into force in 2013, many firms were subject to other carbon reporting requirements, such as EU ETS and CRC. The conventional business response to these is to regard compliance as a minimum level of achievement (Jones and Levy, 2007; Kauffmann *et al.*, 2012). Over 60% of our informants explained that carbon reporting occurs because their firm is legally obligated to do it. Asked to explain why they report, one informant simply replied:

First thing, we have to. We are mandated to report on our carbon emissions (Financial Service D, Interview 1).

Reporting protects a firm from financial penalties and carbon taxes as well as from any negative publicity that may arise from failing to comply (Gouldson and Bebbington, 2007; Eberlein and Matten, 2009). Indeed, when asked about the potential consequences of non-compliance, interviewees, almost to a person, insisted that they would do what was necessary to avoid the financial and reputational risks of non-compliance:

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EU ETS has to be reported to the required standards. Have appropriate verification in place and all that sort of thing. We do that because it is a legal requirement. We have to comply with these schemes, like any other legally required firm, because it can be very costly if we fail to do them correctly (Extractive C, Interview 1).

Stiff penalties, reputational as much as financial, for failing to do it right mean that firms treat reporting as just one of those things they have to do. Reporting is a normative duty of responsible corporate citizenship. Nevertheless, our review of 168 company reports found six (5%) failing to meet all of the reporting requirements under the new MCR two years after it came into force.

While decisions to go beyond minimum regulatory disclosure requirements were typically driven by economic or reputational considerations, a few firms described how carbon reporting helped them manage other regulatory demands (Andrew and Cortese, 2011). Emission data is used by economically regulated firms in bids to the regulator:

The results of annual and interim carbon reporting are used to track progress of schemes designed to reduce our energy use and emissions. They are also used to make cases [to the regulator] for new energy and carbon saving projects that will require additional financial support. We publish reports on the website so that customers, suppliers, students, and governing bodies have access (Water B, Interview 2).

Emission data can also help economically regulated firms such as this to justify price increases to fund new capital investments needed to reduce emissions and yield other social benefits. Carbon reporting was also used by economically regulated firms to defend against criticism and avoid blame for price increases by pointing to the environmental improvements those price rises are buying (cf. Hood, 2002). Energy utility firms in particular are under intense pressure to explain why falling wholesale energy costs are not being passed on to consumers, who have experienced rising energy bills for the last decade. Interviewees from two of four case study energy utilities explained that they have used government climate policy and mandatory schemes as reasons to justify price rises:

We communicate that energy prices are going up because we have to do this green obligation stuff that the Government signed up to (Energy Utility B, Interview 2).

Firms claim that climate policy and schemes impact operational costs to such an extent that these costs need to be reflected in bills. Carbon reporting is used as a tool to communicate that energy prices are heavily influenced by conditions that are out of the firm's hands.

Another benefit of complying with reporting schemes is the potential to deflect the implementation of more stringent regulations (Sullivan, 2008; Eberlein and Matten, 2009). Some firms see reporting as a means of engaging with regulators about the shape of future regulation. Some interviewees went as far to say that their firm works with regulators to establish a clear and stable regulatory framework that is economically efficient to respond to.

We engage regulators to make sure that the regulations for reporting make sense, so it's not an unjust burden and so forth (Extractive C, Interview 1).

This suggests that carbon reporting is strategically performed by some firms to avoid shocks and maintain some degree of control on their future reporting obligations.

Impacts of Reporting on Business Process and Internal Organization

The practice of carbon reporting has had a number of impacts on the internal organization of UK corporations. First, compiling emission data in the required formats for reporting has pushed firms to tighten internal coordination and establish new reporting lines, as this informant explained:

There are benefits in terms of being able to work more closely with the financial department. They have to engage more with the sustainability team, which is good for us (Financial Service E, Interview 1).

Carbon reporting was relatively new to this informant's firm, which was still finding its way. By contrast, respondents from the water and energy utilities saw statutory reporting requirements as less transformative because they had long been required by their economic regulators, Ofwat and Ofgem, to include emission data as part of their bids for price increases to support capital investment in energy efficiency.

I don't think it [the MCR] will change anything drastically for us. We already report to Ofwat our GHG emissions annually and that is based on the Defra methodology, which is similar to the carbon mandate guidance (Water A, Interview 2).

All 19 of our case study firms now collect data on Scope 1 and 2 emissions as defined by the Greenhouse Gas Protocol. A smaller number (nine) collect some data on Scope 3 emissions, typically associated with flights and business travel, which are relatively easy to collect compared with the full life cycle analysis that might be required to trace the emissions arising up and down the supply chain. Since these indirect Scope 3 emissions incur no cost to the firm, the rationale for collecting them was invariably reputational and tied to participation in voluntary reporting schemes such as CDP's Climate Change Program that score firms more favourably if this additional information is reported.

While there are now well established accounting protocols for reporting these different types of GHG emission, there were important differences in the way that different firms organized themselves in order to do their reporting. In energy intensive firms, operational units are often responsible for collecting data about their own emissions. Autonomy is important because the technical complexities of different operations mean that only these units know what is happening locally.

Quantitative emission data comes from refining, exploration, and production because they generate emissions. They know how and why. This is fed through an established process to be reported and managed at group level (Extractive A, Interview 2).

In this set-up responsibility for data collection is devolved to the various operational units, which submit emission data to an internal database. This is then accessed by the central reporting unit, typically located in a corporate sustainability or management accounting department, which then accesses them in order to monitor performance, collate information in accordance with whatever scheme the firm is responding to, and check for commercial sensitivity.

Greater technical expertise in energy intensive firms, combined with larger and potentially more embarrassing emission profiles, meant that these firms were more likely to adopt their own bespoke metrics for reporting their emissions. Thus, instead of reporting their emissions in terms of kilotonnes (ktCO₂e) or million tonnes (mtCO₂e) of carbon dioxide equivalent emissions, the coal-fired Drax power station reported its 2012 emissions in terms of CO₂ emissions per unit of output, whereas the electricity generator E.ON, one of the so-called 'big six' energy providers in the UK, reported its 2012 emissions in terms of carbon intensity in metric tons of CO₂ per megawatt hours (MW h) of electricity generated.

By contrast, less energy intensive firms tended to organize their reporting differently. Typically the central reporting team took lead responsibility for collecting as well as collating and externally reporting emission data:

We have a project manager who collects data and information from everywhere. We use a materiality matrix process to decide what we should be reporting on. This is made up of information taken from reporting frameworks. Data collection is performed, and we then put that together and report outwards (Financial Service A, Interview 1).

Non-energy-intensive firms were also much less likely to depart from standard reporting metrics such as ktCO₂e/year. Of the 62 non-energy-intensive firms in our sample disclosing their emissions publicly, only Talk Talk Group (2013) used alternative metrics: in its case tonnes of CO₂ equivalent per Gigabit.

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A second major impact of carbon reporting has been to raise the profile of GHG emissions and climate change more generally within firms (González-Benito and González-Benito, 2006; Hahn and Kühnen, 2013). Whereas company directors did not routinely review the emission data reported through voluntary schemes such as the Carbon Disclosure Project, board-level sign-off is now required under the UK Government's new MCR since emission data must be included as part of the annual directors' report. As a result, the board now signs off on these mandatory emissions reports, in a way that had not always been true for firms that had previously been participating in voluntary reporting schemes. Informants from less energy intensive sectors in particular emphasized how board-level sign-off had significantly increased the profile of carbon emissions within their firms:

The statutes have meant sustainability and addressing carbon have become more significant in the managers' agenda. More people are taking it seriously throughout the business (Financial Service E, Interview 1).

These comments about the importance of board-level sign-off in driving awareness and in carbon emissions were echoed in responses to the 2016 government consultation on reforming the business energy tax efficiency landscape (HM Treasury, 2016, 2.6). Heightened awareness, in turn, provided a reason for those charged with reporting to approach and consult operational units that had previously been unconcerned with social and environmental impacts, reinforcing the internal coordination impacts of carbon reporting. In this way greater awareness and closer coordination are mutually reinforcing.

As awareness has grown, firms have also become more selective about their participation in voluntary indexes.

We no longer do Dow Jones Sustainability Index, FTSE4Good, or Corporate Responsibility Index. We only do CDP's Climate Change Program and undertake the Carbon Trust Standard. A decision was made to only participate in indices we thought were right for the business (Water D, Interview 1).

Unless there is a positive impact or it mitigates risks, voluntary reporting is perceived to be “nice to do”, but not a “must do” for those that can “fly under the radar” (Stubbs *et al.*, 2013, p. 466).

There are important sectoral differences in the awareness impacts of the new statutory reporting requirements. Informants from energy intensive and economically regulated firms were less likely to see the new statutory carbon requirements as particularly influential, insofar as financial and regulatory drivers meant that they were already accounting for their emissions:

It [the MCR] doesn't look like there is anything in there that we don't do already (Extractive A, Interview 1).

Consequently for these firms the new requirements did relatively little to raise awareness of the importance of climate change.

By contrast, informants from less energy intensive sectors saw the statutory reporting requirements as more influential in raising the profile of emissions within their firms, but also more burdensome. As one financial services informant explained,

More savings can be made from re-negotiating your energy supply than actually reducing energy (Financial Service C, Interview 1).

Without strong financial or regulatory incentives to reduce their emissions, statutory disclosure requirements were crucial in overcoming the general indifference of the financial services and telecommunication firms within our case study sample to doing anything significant about emissions, which were otherwise regarded as insignificant to company performance.

Third, a few firms have responded to the increased saliency of carbon emissions by explicitly incorporating emission reductions targets into their remuneration strategies:

We've got incentives where if we perform well environmentally, where we can prove we are reporting well on our emissions, then we are going to get some cash benefits from it (Energy Utility A, Interview 3).

Similar remuneration schemes were reported by interviewees from eight different firms. Employees – on either an individual, team, or entire operational unit basis – are rewarded with bonuses and/or base pay rises if specified emission reduction targets are met or the firm performs well in voluntary indexes. Such incentivization strategies raise interesting questions about the internal negotiations concerning what the data is actually saying, what it could say, and how to best present the data publicly to maintain business growth (Nyberg and Wright, 2012). To overcome concerns about potentially cooking the numbers, many firms looked to third party assurance ‘to ensure the credibility of our data’ (Standard Chartered, 2014, p. 28). Those involved in third party assurance typically described it in terms of enhancing external credibility:

Assurance helps try and combat the stakeholders’ opinion that the firm is trying to greenwash (Consultant B, Interview 1).

However, with remuneration increasingly tied to emission targets, assurance was also understood by informants as part of normal internal audit and corporate control processes. Arguably, this normalization of auditing emissions weakens the pressure that can be exerted by external stakeholders to change behaviour (Sullivan and Gouldson, 2017).

Impacts of Reporting on Business Performance and the External Environment

It was very common in both annual reports and interviews to claim that the practice of carbon reporting (e.g. measure, monitor, manage) had helped improve both the environmental and economic performance of participating firms. The following comment is typical of the sort of generalized claim made in annual reports:

We monitor our electricity usage, carbon emission levels and use of renewable energy. Most of our larger operations have high levels of electricity self-sufficiency. We focus on improving the energy efficiency of our operations and have invested in our operations to improve our energy profile and increase electricity self-sufficiency, while reducing ongoing operating costs and carbon emission levels (Mondi Group, 2015, p. 41).

Similar sentiments were expressed by two-thirds of interviewees. They credited carbon reporting with improving business performance:

The results of annual and interim carbon and sustainability reporting are used to track progress of schemes designed to reduce our energy use and carbon emissions (Water B, Interview 2).

Although efficiency gains were one common rationale for reporting, only a few interviewees could point to tangible measures undertaken by their firms in response to the emission data they were collecting. The specificity of this informant about the impacts of reporting on business performance was unusual:

Carbon reporting has been positive It has led to us developing a five-year 17% energy reduction target across all of our sites (Extractive A, Interview 1).

For this company, the capability of quantifying their emissions through carbon reporting allows them to actively govern and manage their emissions (Caritte *et al.*, 2015).

Outside the energy intensive sectors, informants often struggled to get beyond the platitudinous. This is partly because for these firms reporting is more about legitimacy-seeking than actually driving environmental performance and profitability. As one financial services informant explained,

Energy reduction is more about having the targets to talk about externally than any internal cost-savings (Financial Service C, Interview 1).

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Such comments raise important questions about the efficacy of reporting in driving emission reductions as envisioned by advocates of ecological modernization (Hajer, 1995).

Such concerns are reinforced by quantitative analysis of the emissions reported in annual reports. Figure 1 plots the ratio of carbon equivalent emissions reported in 2015 against those reported in 2014. 139 firms in our sample provide complete and comparable data in the first two years after the introduction of the new statutory MCR. While more firms (63%) report emission reductions than increases, the mean year-on-year change across all 139 firms is substantially skewed by seven firms reporting increases of more than 25%. Apart from a handful of firms at either extreme, most firms (72%) reported modest changes in their emission profiles of less than 10% either positive or negative.

While most sectors were split fairly evenly between firms reporting increases and decreases, there was a tendency for firms in the energy intensive utilities sector and in the consumer goods and consumer services sectors to report emission reductions, though there were also some firms in these sectors reporting increases, so it is difficult to tell if these represent secular changes in the sector or broader economy or firm-level variation. The high standard deviations in emission performance among firms in the healthcare and financial services industries, as well as in the more energy intensive industrials and extractive, oil & gas and basic materials sectors, suggest the importance of firm-level factors, rather than sectoral shifts, as the key determinant of performance.

Management studies scholars have offered a number of competing hypotheses to explain these uneven patterns of performance. On the one hand, scholars have often theorized that voluntary reporting is more likely from firms with a good story to tell about their success in reducing emissions (Clarkson *et al.*, 2008; Rankin *et al.*, 2011). Alternatively others have emphasized the pressure on 'dirty' industries to secure their societal licence to operate through legitimacy-seeking disclosure and transparency (Fung *et al.*, 2007; Pellegrino and Lodhia, 2012). From either perspective we might expect to see a difference in the emission reductions reported by early voluntary reporters as against the laggards only reporting for the first time under the MCR. To test for this and any interactions between sector and early versus late reporting, we conducted a two-way ANOVA ($F(2, 120) = 0.161, p = 0.990$) but found no statistically significant interactions between sector and early reporting and no meaningful differences in the year-on-

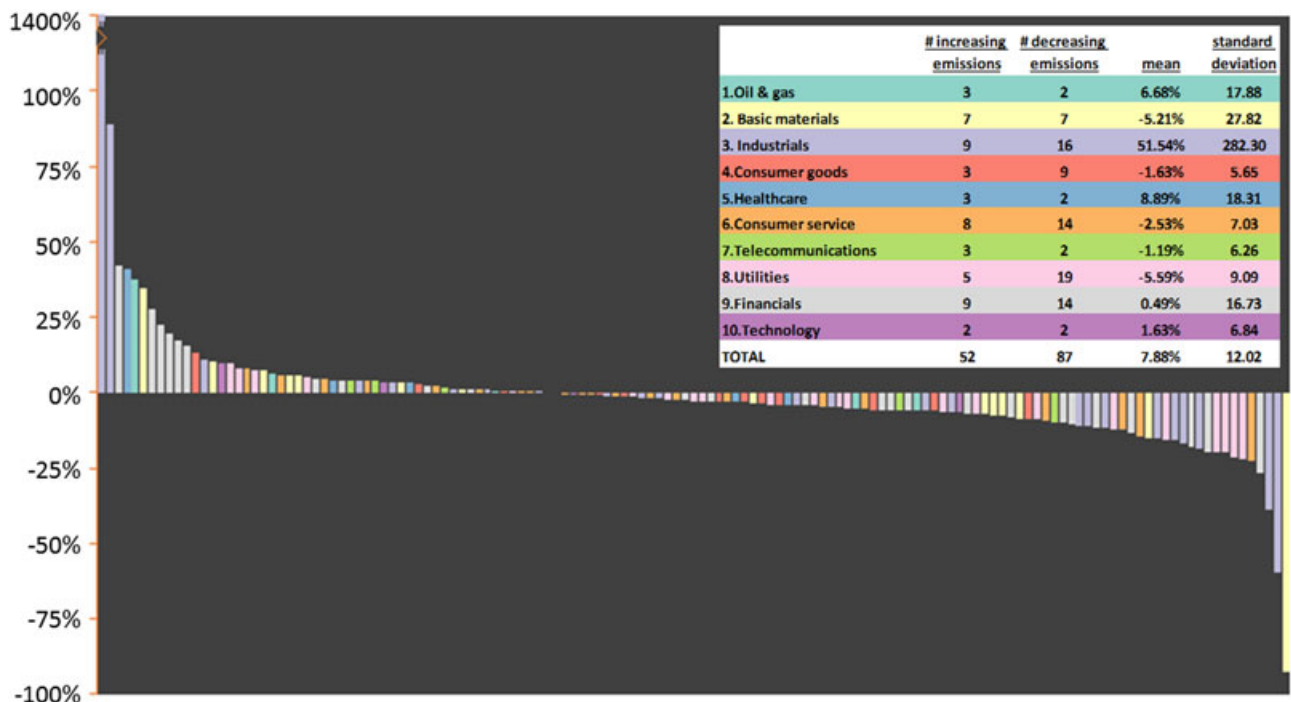


Figure 1. Percentage change in GHG emissions from 2014 to 2015, all MCR compliant firms

year emission reduction performance between those firms that had reported voluntarily before the MCR came into force and those that only disclosed their emissions after 2013 when compelled to do so by the MCR.

Caution is required in drawing firm conclusions about the efficacy of reporting on firm performance from just two years of data. As one of our informants explained,

The problem I have with all of the carbon reporting is it is a set of figures which are actually meaningless in isolation. If you look at our target performance over the last ten years at the beginning we made a lot more progress than we do now. If someone picks up our report last year then they would think we have done nothing (Financial Service D, Interview 1).

To explore this possibility, Figure 2 plots the rate of short-term emission change from 2014 to 2015 (x-axis) against the rate of emission change over the longer term of 2012 to 2015 (y-axis) for 119 firms in our sample making consistent and comparable emission data available in their annual reports. Like 10% of the firms for which data is available, Financial Service Firm D fell into Quadrant IV, with 2015 emissions increasing in the short term from 2014 levels but still lower than in 2012. Most firms (76.4%) were more consistent in their performance over both the short and longer term, falling either into Quadrant I for those with consistently increasing emissions or Quadrant III for those with consistently decreasing emissions. Amongst those with decreasing emissions there is evidence of diminishing returns, with the rate of decrease slowing. But 10.1% of firms fell into Quadrant IV with recent increases in emissions relative to the 2014 baseline suggesting that the longer-term declines relative to the

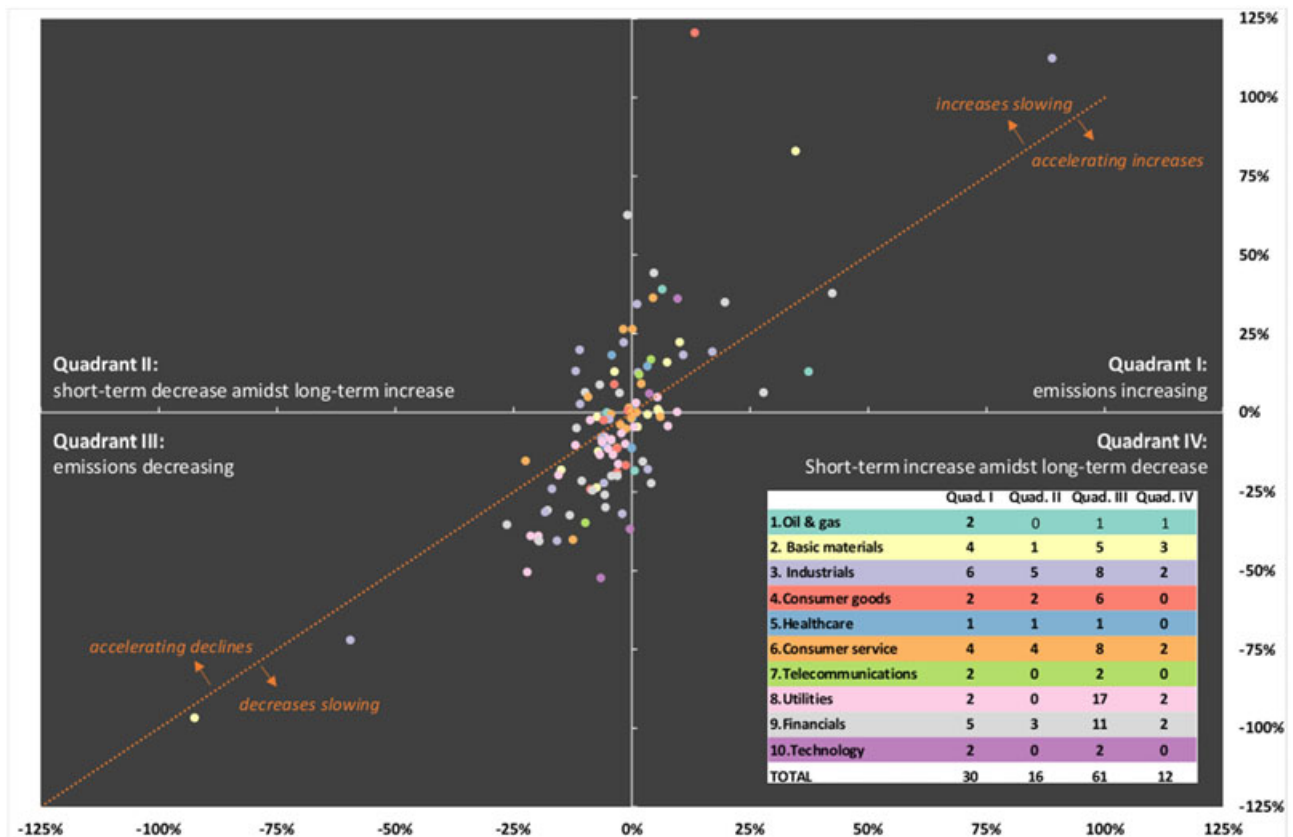


Figure 2. 2015 GHG emissions as a percentage of 2014 emissions (x-axis) versus those as a percentage of 2012 emissions (y-axis), 119 early reporting firms. N.B. scatterplot excludes one outlier from the industrials sector at 1402%, 889%

2012 baseline may have been driven by secular impacts of the Great Recession and anaemic growth in the UK economy 2010–12 rather than concerted efforts at improving environmental performance.

At the sectoral level energy intensive utilities showed the most consistent emission declines. However, the pattern of performance in other sectors was much less clear and one-way ANOVA showed no statistically significant differences among sectors in longer-term emission reduction.

Discussion

Carbon reporting was commonplace among leading UK corporations before the government imposed mandatory carbon reporting. Our research has shown that companies engaged in the practice for a number of different reasons, including financial gain, reputational considerations, and regulatory compulsion. The prospect of savings typically loomed larger for energy intensive firms than for non-energy-intensive ones, which were more commonly driven to report by social pressure and the desire to manage their reputation. Regulatory considerations were a more important rationale for firms and sectors that were economically regulated than for those that were not.

There were also sectoral differences in the impact of reporting on internal business processes, albeit not as stark as those in reporting rationales. The scale and complexity of their emission profiles led energy intensive firms to grant operational units more autonomy in reporting than non-energy-intensive firms, where data collection and reporting were more typically coordinated by a central reporting unit. The role of mandatory reporting in raising awareness of carbon emissions also differed. In energy intensive and economically regulated sectors, carbon emissions have long been board-level concerns, because of the costs of energy consumption and the saliency of climate change in regulatory filings and in bids to the regulator for price increases. By contrast, informants in less energy intensive firms and in sectors not subject to price-setting economic regulators often reported that the new statutory requirement that carbon reporting be incorporated in the annual reports signed off by the board had raised the profile of the issue in their firms. A number of firms are now incorporating emission reduction into their remuneration strategies.

However, despite these important sectoral differences in the rationales for carbon reporting and its internal impacts on business organization, we found no clear sectoral patterns in the impacts of reporting on business performance and the external environment. Indeed, we found limited evidence for the efficacy of carbon reporting in consistently driving emission reductions. Some firms were able to reduce their emissions year on year, while others increased them, but there were no consistent patterns across the firms for which comparable data are publicly available.

Nevertheless, our comparative analysis does suggest several key drivers shaping corporate motives for and internal responses to carbon reporting (cf. Eleftheriadis and Anagnostopoulou 2014). In particular, our analysis highlights the importance of both energy intensity and the regulatory status of firms in determining the importance of emission reduction to the bottom line and thereby shaping their motives for and organizational responses to carbon reporting. Whereas energy intensity creates financial incentives to use reporting to drive emission reduction, the presence of economic regulation and the importance of climate change to that regulator increases reporting compliance and the utility of those reports for actual emission reduction. Based on these two variables we can create a 2×2 table to predict the response of firms to new carbon reporting requirements (Table 3).

Energy intensive and economically regulated firms, at the bottom right of Table 3, face mutually reinforcing economic and regulatory incentives to report in full and use this information to reduce emissions, both to increase the bottom line and to curry favour with the regulator. Our energy and water utility case study sectors both fell into this category. Thus we would also expect the energy intensive and economically regulated rail sector to be subject to similar dynamics and to respond in the way that the water and energy utilities have. Although civilian aviation is not subject to price-setting, airport capacity is closely regulated and we might expect it to be similar. Their reliance on fuel to operate and high emission contribution, as well as their regulatory status and public-facing nature, mean that carbon reporting is an avenue for them to manage their stakeholder relationships by reducing the potential negativity over changing costs in their service and emission increases from business growth.

	Non-energy intensive	Energy intensive
Non-Economically regulated	<p><i>Performative legitimacy seeking</i></p> <p>Reporting shaped by reputational concerns and liable to be de-coupled from actual practice without strong brand differentiation or consumer pressure for emission reduction.</p>	<p><i>Competitive eco-modernism</i></p> <p>Strong financial pressures to reduce emission, but degree of disclosure will depend on reputational concerns.</p>
Economically regulated	<p><i>Compliant legitimacy-seeking</i></p> <p>With little direct financial incentive to reduce emissions, reporting shaped by reputational concerns and opportunities for regulatory arbitrage, which will determine the degree to which reporting is closely coupled to effective mitigation action.</p>	<p><i>Compliant efficiency-seeking</i></p> <p>Mutually reinforcing economic and regulatory incentives to couple detailed reporting to substantial emission reduction.</p>

Table 3. Sectoral characteristics shaping carbon rationales and responses

For energy intensive but non-economically-regulated firms, at the upper right of Table 3, we would predict that strong economic incentives will drive emission reduction, but without the need for regulatory filings the degree of disclosure will depend on competitiveness concerns. Our extractives case study sector fell into this category, thus we would expect other energy intensive industrial sectors, such as basic materials and industrials, to be subject to similar dynamics, whereby reporting is about win–win outcomes such as identifying economic savings by reducing their large energy consumption and carbon taxes. Once achieved, firms may then use reporting to create some market differentiation that highlights the strength of their emission performance and scope of actions.

For non-energy-intensive and non-economically-regulated firms, at the upper left of Table 3, we would predict that carbon reporting will be chiefly driven by reputational considerations, since there are few opportunities for financial savings from reducing energy and emissions, and because of their public-facing nature. Reporting provides market differentiation opportunities to gain new business by outperforming competitors in voluntary reporting indexes and undertaking novel or sector leader practice. Therefore, decisions to report and act are likely to be influenced by the scope of reputational gains they return. Our financial services case study sector fell into this category, thus we would expect other consumer-facing industrial sectors such as consumer goods, consumer services and healthcare to be subject to similar dynamics.

For non-energy-intensive and economically regulated firms, at the bottom left of Table 3, we would predict that carbon reporting is about being auditable to their stakeholders. Although they cannot make big financial savings from reducing energy and emissions, reporting can be an important tool to manage their relationship with the regulator, who can restrict their business growth if they do nothing. Though none of our case study sectors fell into this category, we would expect telecommunication firms, which are non-energy-intensive but economically regulated, to follow this behaviour. Reducing energy and emissions is not likely to yield significant financial benefits, but carbon reporting to performative standards will help manage relationships with the regulator, who has a more significant impact on performance.

Whilst the typology provides a useful classification of corporate carbon responses, it overlooks how specific resources and capabilities of a firm also drive business strategy and performance alongside the more general sectoral-level characteristics identified in this study (e.g. energy intensity, economic regulation). Firm specific characteristics empirically identified as causing variability in environmental strategy (González-Benito and González-Benito, 2006; Hahn and Kühnen, 2013; Muttakin *et al.*, 2015) and climate change strategy (Wahyuni and Ratnatunga, 2015; Amran *et al.*, 2016) include corporate size, internationalization, financial performance (e.g. liquidity or profitability), managerial attitude, managerial international experience, strategic direction and attitude, ownership structure, board diversity, and position in the value chain, among others. For example, firms with a positive managerial attitude that is supportive, committed and knowledgeable are likelier to take action and disclose information because managerial endorsement increases access to essential resources necessary for implementation (e.g.

finance, technology) and/or the extent of cross-organizational engagement and collaboration. Given managerial attitude's impact on environmental and climate change strategies, it is probable that this (and other characteristics) will also affect the four broad categories of carbon reporting response. That is, firm specific characteristics will cause variability between the carbon reporting responses of firms classified in the same category.

Conclusion

Getting firms to participate in carbon reporting is often assumed to lead to an enhanced application of climate mitigation measures. This assumption is based on an argument that behavioural change will occur because reporting will encourage firms to develop a deeper understanding of an issue or topic, while being forced to disclose their performance publicly will incentivize them to take steps to improve that performance. This study found that the influence of carbon reporting varies by sector and depends on key variables such as energy intensity and regulatory status. In the case of carbon reporting, CSR requirements designed to nudge firms into action have had important impacts on firms, but more on their internal operation and outward face than on the external environment itself. Arguably those internal changes are preconditions for substantial shifts in the environmental impacts of business, but the case of carbon reporting suggests reasons for caution about the enthusiasm sometimes invested in CSR. We found some evidence of reporting to report and greenwashing, as well as of ecological modernizing, but overall the impacts of carbon reporting seem modest.

References

- Amran A, Ooi SK, Wong CY, Hashim F. 2016. Business strategy for climate change: an ASEAN perspective. *Corporate Social Responsibility and Environmental Management* 23(4): 213–227. <https://doi.org/10.1002/csr.1371>
- Andrew J, Cortese C. 2011. Carbon disclosures: understandability, the Carbon Disclosure Project and the Greenhouse Gas Protocol. *Australasian Accounting Business and Finance Journal* 5: 5–18.
- Antofagasta PLC. 2014. Sustainability: Energy and Climate Change. <http://www.antofagasta.co.uk/sustainability/energy-and-climate-change.aspx> [10 July 2014].
- Bansal P, Roth K. 2000. Why companies go green: a model of ecological responsiveness. *Academy of Management Journal* 43(4): 717–736.
- Boiral O, Henri J-F, Talbot D. 2012. Modeling the impacts of corporate commitment on climate change. *Business Strategy and the Environment* 21(8): 495–516.
- Bowen F. 2014. After Greenwashing: Symbolic Corporate Environmentalism and Society. Cambridge University Press: Cambridge.
- Caritte V, Acha S, Shah N. 2015. Enhancing corporate environmental performance through reporting and roadmaps. *Business Strategy and the Environment* 24(5): 289–308.
- CDP. 2013. Are UK Companies Prepared for the International Impacts of Climate Change? FTSE 350 Climate Change Report 2013. http://www.pwc.co.uk/en_UK/uk/assets/pdf/cdp-ftse350-climate-change-2013.pdf [7 November 2014].
- CDP. 2014. The A List: the CDP Climate Performance Leadership Index 2014. <https://www.cdp.net/CDPResults/CDP-climate-performance-leadership-index-2014.pdf> [10 February 2015].
- Clarkson PM, Li Y, Richardson GD, Vasvari FP. 2008. Revisiting the relation between environmental performance and environmental disclosure: an empirical analysis. *Accounting, Organizations and Society* 33: 303–327.
- Corbin JM, Strauss A. 1990. Grounded theory research: procedures, canons, and evaluative criteria. *Qualitative Sociology* 13(1): 3–21.
- Cotter J, Najah MM. 2012. Institutional investor influence on global climate change disclosure practices. *Australian Journal of Management* 37: 169–187.
- Crown. 2006. Companies Act 2006. <http://www.legislation.gov.uk/ukpga/2006/46/contents> [7 June 2014].
- Dawkins C, Fraas JW. 2011. Coming clean: the impact of environmental performance and visibility on corporate climate change disclosure. *Journal of Business Ethics* 100(2): 303–322.
- Defra. 2014. Measuring and Reporting Environmental Impacts: Guidance for Businesses. <https://www.gov.uk/measuring-and-reporting-environmental-impacts-guidance-for-businesses#reporting-greenhouse-gas-emissions> [6 June 2014].
- Delmas M, Russo MV, Montes-Sancho MJ. 2006. Deregulation and environmental differentiation in the electric utility industry. *Strategic Management Journal* 28(2): 189–209. <https://doi.org/10.1002/smj.578>
- Demeritt D, Dyer S. 2002. Dialogue, metaphors of dialogue and understandings of geography. *Area* 34(3): 229–241.
- Eberlein B, Matten D. 2009. Business responses to climate change regulation in Canada and Germany: lessons for MNCs from emerging economies. *Journal of Business Ethics* 86: 241–255.
- Eccles RG, DiPiazza SA. 2002. Building Public Trust: the Future of Corporate Reporting. Wiley: New York.

- Eleftheriadis IM, Anagnostopoulou EG. 2014. Relationship between corporate climate change disclosures and firm factors. *Business Strategy and the Environment* 24(8): 780–789.
- Escobar MP, Demeritt D. 2017. Paperwork and the decoupling of audit and animal welfare: the challenges of materiality for better regulation. *Environment and Planning C: Politics and Space* 35: 169–190.
- Ford JD, Pearce T, Prno J, Duerden F, Berrang Ford L, Beaumier M, Smith T. 2010. Perceptions of climate change risks in primary resource use industries: a survey of the Canadian mining sector. *Regional Environmental Change* 10: 65–81.
- Fung A, Graham M, Weil D. 2007. Full Disclosure: the Perils and Promise of Transparency. Cambridge University Press: New York.
- Furrer B, Hamprecht J, Hoffmann VH. 2012. Much ado about nothing? How banks respond to climate change. *Business and Society* 51(1): 62–88.
- Gasbarro F, Rizzi F, Frey M. 2014. Adaptation measures of energy and utility companies to cope with water scarcity induced by climate change. *Business Strategy and the Environment* 25(1): 54–72.
- Giannarakis G, Zafeiriou E, Sariannidis N. 2017. The impact of carbon performance on climate disclosure. *Business Strategy and the Environment* <https://doi.org/10.1002/bse.1962>
- González-Benito J, González-Benito Ó. 2006. A review of determinant factors of environmental proactivity. *Business Strategy and the Environment* 15: 87–102.
- Gouldson A, Bebbington J. 2007. Corporations and the governance of environmental risks. *Environment and Planning C: Politics and Space* 25(1): 4–20.
- Gouldson A, Sullivan R. 2012. Ecological modernisation and the spaces for feasible action on climate change. In *Climate Change and the Crisis of Capitalism: a Chance to Reclaim Self, Society and Nature*, Pelling M, Manuel-Navarrete D, Redclift M (eds). Routledge: London; 114–125.
- Gouldson A, Hills P, Welford R. 2008. Ecological modernisation and policy learning in Hong Kong. *Geoforum* 39: 319–330.
- Green JF. 2010. Private standards in the climate regime: the Greenhouse Gas Protocol. *Business and Politics* 12(3): 1–37.
- Greer J, Bruno K. 1996. Greenwash: the Reality Behind Corporate Environmentalism. Penang, Malaysia: Apex.
- Hahn R, Kühnen M. 2013. Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production* 59: 5–21.
- Hahn R, Reimsbach D, Schiemann F. 2015. Organizations, climate change, and transparency: reviewing the literature on carbon disclosure. *Organization and Environment* 28(1): 80–102. <https://doi.org/10.1177/1086026615575542>
- Hajer M. 1995. The Politics of Environmental Discourse: Ecological Modernization and the Policy Process. Oxford University Press: New York.
- Hammerson. 2014. 2013 Annual Report. <https://www.hammerson.com/investors/reports/2013-annual-report/> [14 September 2017].
- Haslam C, Butlin T, Andersson T, Malamatenios J, Lehman G. 2014. Accounting for carbon and reframing disclosure: a business model approach. *Accounting Forum* 28: 200–211.
- HM Treasury. 2016. *Reforming the Business Energy Efficiency Tax Landscape: Response to the Consultation*. HM Treasury: London. <https://www.gov.uk/government/consultations/consultation-reforming-the-business-energy-efficiency-tax-landscape> [14 September 2017].
- Hoffman AJ. 2005. Climate change strategy: the business logic behind voluntary greenhouse gas reductions. *California Management Review* 47(3): 21–46.
- Hoffman AJ. 2007. Carbon Strategies: How Leading Companies Are Reducing Their Climate Change Footprint. University of Michigan Press: Ann Arbor, MI.
- Hood C. 2002. The risk game and the blame game. *Government and Opposition* 37: 15–37.
- Ihlen Ø. 2009. Business and climate change: the climate response of the world's 30 largest corporations. *Environmental Communication* 3(2): 244–262. <https://doi.org/10.1080/17524030902916632>
- Jahdi K, Acikdilli G. 2009. Marketing communications and corporate social responsibility (CSR): marriage of convenience or shotgun wedding? *Journal of Business Ethics* 88: 103–113.
- Jones CA, Levy DL. 2007. North American business strategies towards climate change. *European Management Journal* 25(6): 428–440.
- Kauffmann C, Tébar Less C, Teichmann D. 2012. *Corporate Greenhouse Gas Emission Reporting: a Stocktaking of Government Schemes*. OECD Working Papers on International Investment, 2012/01. OECD Publishing. <https://doi.org/10.1787/5k97g3x674lq-en>
- Knox-Hayes J, Levy D. 2011. The politics of carbon disclosure as climate governance. *Strategic Organization* 9: 91–99.
- Kolk A, Pinkse J. 2004. Market strategies for climate change. *European Management Journal* 22(3): 304–314.
- Kolk A, Levy D, Pinkse J. 2008. Corporate responses in an emerging climate regime: the institutionalization and commensuration of carbon disclosure. *European Accounting Review* 17: 719–745.
- Lee SY. 2012. Corporate carbon strategies in responding to climate change. *Business Strategy and the Environment* 21(1): 33–48.
- Levy DL, Egan D. 2003. A neo-Gramscian approach to corporate political strategy: conflict and accommodation in the climate change negotiations. *Journal of Management Studies* 40: 803–829.
- Levy DL, Kolk A. 2002. Strategic responses to global climate change: conflicting pressures on multinationals in the oil industry. *Business and Politics* 4(3): 275–300.
- Lyon TP, Maxwell JW. 2004. Corporate Environmentalism and Public Policy. Cambridge University Press: Cambridge.
- Lyon TP, Maxwell JW. 2011. Greenwash: corporate environmental disclosure under threat of audit. *Journal of Economics and Management Strategy* 20(1): 3–41.
- Matisoff DC, Noonan DS, O'Brien JJ. 2013. Convergence in environmental reporting: assessing the Carbon Disclosure Project. *Business Strategy and the Environment* 22(5): 285–305. <https://doi.org/10.1002/bse.1741>
- Milne MJ, Grubnic S. 2011. Climate change accounting research: keeping it interesting and different. *Accounting, Auditing & Accountability Journal* 24: 948–977.
- Mol A, Sonnenfeld D, Spaargaren G. 2009. The Ecological Modernization Reader: Environmental Reform in Theory and Practice. Routledge: London.

- Mondi Group. 2015. *Integrated Report and Financial Statements 2015*. <http://reports2015.mondigroup.com/downloads/integrated-report-and-financial-statements-2015.pdf> [20 February 2017].
- Muttakin MB, Khan A, Subramaniam N. 2015. Firm characteristics, board diversity and corporate social responsibility: evidence from Bangladesh. *Pacific Accounting Review* 27(3): 353–372.
- Nyberg D, Wright C. 2012. Justifying business responses to climate change: discursive strategies of similarity and difference. *Environment and Planning A* 44: 1819–1835.
- O'Donovan G. 2002. Environmental disclosures in the annual report: extending the applicability and predictive power of legitimacy theory. *Accounting, Auditing & Accountability Journal* 15: 344–371.
- Okereke C. 2007. An exploration of motivations, drivers and barriers to carbon management: the UK FTSE 100. *European Management Journal* 25(6): 475–486.
- Pellegrino C, Lodhia S. 2012. Climate change accounting and the Australian mining industry: exploring the links between corporate disclosure and the generation of legitimacy. *Journal of Cleaner Production* 36: 68–82.
- Pfeifer S, Sullivan R. 2008. Public policy, institutional investors and climate change: a UK case-study. *Climatic Change* 89: 245–262. <https://doi.org/10.1007/s10584-007-9380-y>
- Power M. 2003. Evaluating the audit explosion. *Law and Policy* 3: 185–202.
- Rankin M, Windsor C, Wahyuni D. 2011. An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australian evidence. *Accounting, Auditing & Accountability Journal* 24(8): 1037–1070. <https://doi.org/10.1108/09513571111184751>
- Shore C. 2008. Audit culture and illiberal governance: universities and the politics of accountability. *Anthropological Theory* 8(3): 278–298.
- Shore C, Wright S. 1999. Audit culture and anthropology: neo-liberalism in British higher education. *Journal of the Royal Anthropological Institute* 5(4): 557–575.
- Sprengel DC, Busch T. 2010. Stakeholder engagement and environmental strategy – the case of climate change. *Business Strategy and the Environment* 20(6): 351–364.
- Standard Chartered. 2014. *Sustainability Review 2013*. http://reports.standardchartered.com/sustainability-review-2013/pdf/2013-Sustainability_Review.pdf [26 July 2016].
- Stanny E, Ely K. 2008. Corporate environmental disclosures about the effects of climate change. *Corporate Social Responsibility and Environmental Management* 15: 338–348. <https://doi.org/10.1002/csr.175>
- Strauss A, Corbin J. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, 2nd edition. Thousand Oaks, CA: Sage.
- Stubbs W, Higgins C, Milne M. 2013. Why do companies not produce sustainability reports? *Business Strategy and the Environment* 22: 456–470.
- Sullivan R. 2008. Setting a future direction for climate change policy. In *Corporate Responses to Climate Change: Achieving Emissions Reductions through Regulation, Self-Regulation and Economic Incentives*, Sullivan R (ed). Greenleaf: Leeds, UK; 334–338.
- Sullivan R, Gouldson A. 2012. Does voluntary carbon reporting meet investors' needs? *Journal of Cleaner Production* 36: 60–67.
- Sullivan R, Gouldson A. 2017. The governance of corporate responses to climate change: an international comparison. *Business Strategy and the Environment* 26(4): 413–425.
- Talk Talk Group. 2013. *Annual Report 2013*. <https://www.talktalkgroup.com/articles/talktalkgroup/2016/New-content/Launch-content/Annual-Report-2013> [19 Jul 2014].
- Tang S. 2016. *Corporate Responses to Climate Change Reporting Requirements in the UK*. PhD thesis, King's College London.
- Tang S, Dessai S. 2012. Usable science? The UK climate projections 2009 and decision support for adaptation planning. *Weather, Climate, and Society* 4(4): 300–313.
- Tauringana V, Chithambo L. 2015. The effects of DEFRA guidance on greenhouse gas disclosure. *British Accounting Review* 47: 425–444.
- Varnäs A, Vulturius G, Benzie M, Carson M, Davis M. 2013. *Broadening Horizons: Business Engagement with Climate Change in 2007 and Today*. Stockholm: Stockholm Environment Institute.
- Vos J. 2009. Actions speak louder than words: greenwashing in corporate America. *Notre Dame Journal of Law, Ethics and Public Policy* 23(2): 673–697.
- Wahyuni D, Ratnatunga J. 2015. Carbon strategies and management practices in an uncertain carbonomic environment – lessons learned from the coal-face. *Journal of Cleaner Production* 96: 397–406.
- Weinhofer G, Hoffmann V. 2010. Mitigating climate change – how do corporate strategies differ? *Business Strategy and the Environment* 19(1): 77–89.
- Yin R. 2003. *Applications of Case Study Research*, 3rd edition. London: Sage.